

RVS Workshop VI

9-10 June 2003

Mullard Space Science Laboratory

R.Y.

RVS status

June 2001 – December 2002

- Definition of the RVS general characteristics



R=11500

January 2003 – December 2004

- Definition and optimisation of the detailed design
- Definition of the on-board processing & assessment of the telemetry
- Definition and test of the calibration strategies
- Assessment of the detailed error budget
- Development of the RVS simulator & GDAAS algorithms
- Assessment of the RVS performances

Workshop objectives

- Review the studies in progress
- Review status of publications
- Review the recent modifications of the design
- Identify hard points and find solutions
 - Software code developer(s)
- Coordinate RVS WG work with other WG
 - Accuracy budget / Simulation / GDAAS
- Refine work breakdown

RVS design

Definition and optimisation of the RVS design

- Optical design
- Mechanical and thermal design
- Tilt mechanism
- CCD and focal plane assembly
- Electronics

RVS design: optics (1)

- Field of view dimensions: 2.5 _ 1.6 deg²
- Coating of the mirrors: Aluminium (for UV)

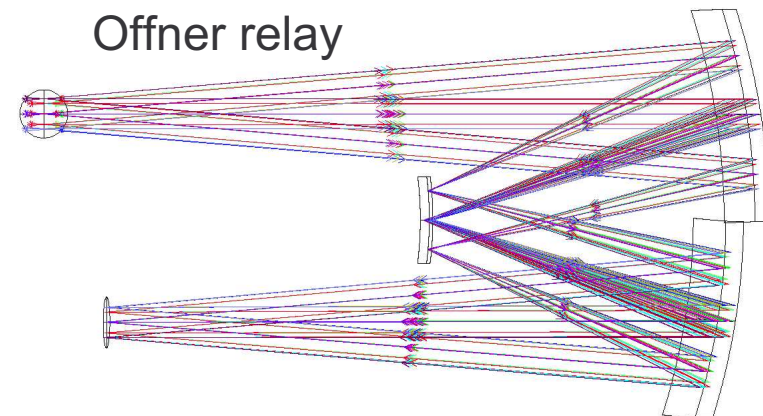
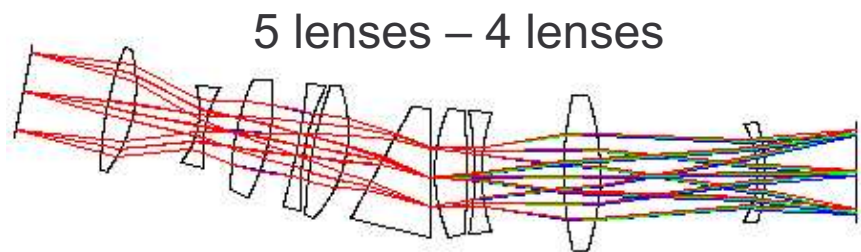
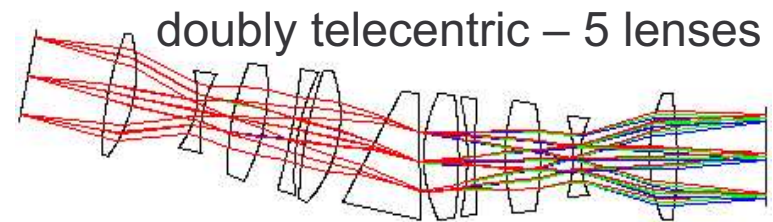
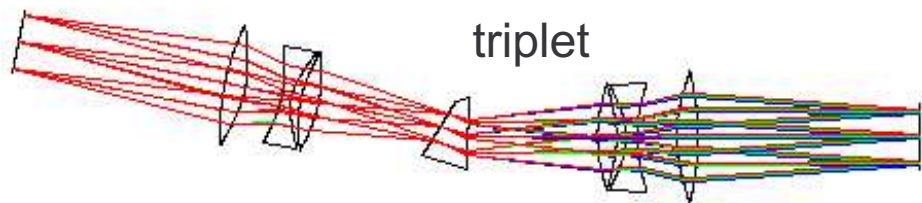
RVS overall efficiency

Mirrors (3)	0.66
Optics (21 surfaces)	0.74
Grating	0.75
Filter	0.85
CCD	0.85
Total	0.26

RVS design: optics (2)

Mass of the “baseline” optical design too large with respect to the mass budget allocated to the spectro instrument:

➔ redefinition of the optical design



RVS design: readout noise

- Increase of the RoN of all the detectors:

	ASM	AF1	AF2+	AF11	BBP	MBSM	MBP	RVSM	RVS
RoN	10	11	5	5	5	4.6	4.1	4.6	4.0
New RoN	14	16	6	6	8	8	8	8	TBD

New RVS RoN : 8 e- ?

- Impact on telemetry
- Impact on the RVS performances:

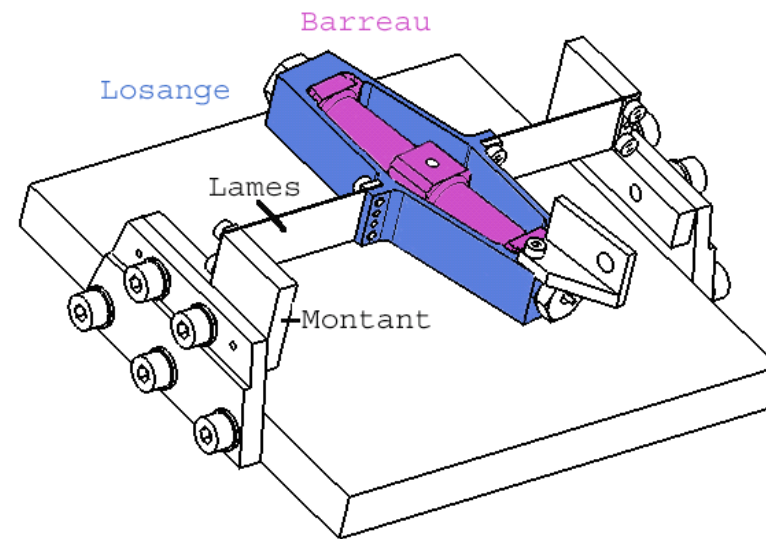
 $V_r = 10 \text{ km/s}$ at $V \sim 17.3$ for a K1V

RVS design: compensate the transverse motion

- Tilt mechanism:
 - Rotation of the CCD
 - Rotation of the field of view
 - Thermal actuator
 - Piezo actuator

- L3CCD

- 2D clocking CCD



RVS design: electronics



Input required:

- Task to be performed
- Data: rate / type / origin / destination



- Define detection and selection strategies
- Define pre-processing strategy
 - CCD co-adding
- Define calibration processes
- Define communication between the instruments
 - ASM - AF1 / RVSM / RVS

Detection, selection & telemetry

- Development of the detection and windowing algorithms
In progress  definition of the sky-mappers roles
- Assessment of the telemetry budget
- Areas of the sky where the telemetric flow will exceed the antenna power
 sources selection strategy

Calibrations

Define and test calibration strategies:

- Wavelength (in progress)
- Background (**TBD**)
- Transmission and CCD (**TBD**)
- PSF profile (**TBD**)
- Geometry of the focal plane (**TBD**)

RV accuracy/error budget (1)

Status: first order performances (taking into account: resolution, sampling, photon/RoN/zodiacal noises)

Next step (inspired by GAIA-LL-043: astro accuracy budget):

Include errors from:

- Sources
- Satellite and environment
- Instrument
- Data pre-processing, calibration and analysis

RV accuracy/error budget (2)

Priorities:

- Source detection and selection (starting soon)
- Optics and detectors (will start after choice of baseline)
- On-board co-adding (in progress)
- Wavelength calibration (in progress)
- Crowding: spectra overlapping (need developer support)
- Recovery of the information from 100 extremely faint exposures (in progress)

Coordinate with assessment of the astro accuracy budget:

GAIA-LL-043, GAIA-JdB-006, GAIA-JdB-008

(L. Lindegren, J. de Bruijne)

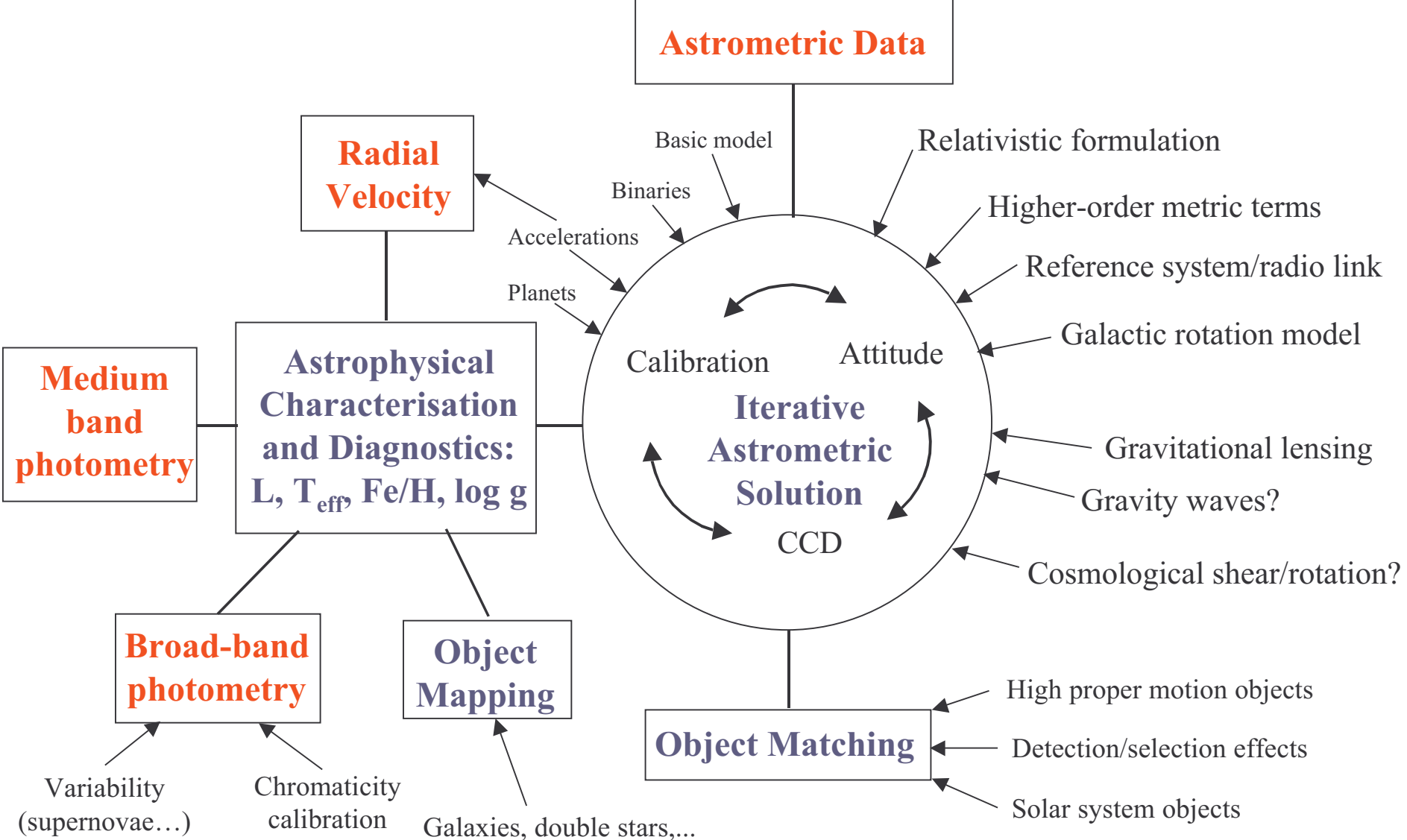
RVS performances & accuracy budget

- Determination of the atmospheric parameters
 - Using also the astrometric / photometric / other (ground) data
- Determination of detailed abundances
 - Calcium, magnesium, silicium
- Rotational velocities
- Interstellar reddening

RVS synthetic spectra

- Refine synthetic spectra computation:
 - Non-LTE
 - Refine atomic data: calcium damping constant
- Simulator of the RVS
 - First version : Single spectrum
Mathematical (Gaussian) PSF
available soon (<http://wwwhip.obspm.fr/gaia/rvs>)
 - Second version : Single spectrum
Accounting for optical/detector effects
 - Third version : Field of view (MSSL simulator)
: will use a Galaxy model

GDAAS (1)



GDAAS (2)

Demonstrator of the database and analysis (phase 1):

- Storage architecture
- Global iterative solution
- Source cross-matching

Demonstrator of the database and analysis (phase 2):

28 algorithms: July 2003 / April 2004 / September 2004

Radial Velocity Spectrometer:

- Radial velocity source detection (April 2004 – developer support needed)
- Wavelength calibration (April 2004 – developer support)
- Radial velocity cross-correlation (July 2003)